REMARKS

Claims 3-9 and 14-19 are pending in the application.

Claims 4 and 6 are amended above to clarify what it is that the Applicant regards as the invention.

Claims 1-2 and 10-11 stand withdrawn.

New claims 14-19 are added to the application.

No new matter has been added to the application by way of these specification and claim amendments.

I. THE RESTRICTION REQUIREMENT

The examiner maintained and made the restriction requirement final in the March 26, 2009 Office Action. In view of the finality of the restriction requirement, the Applicant has withdrawn claims 1-2 and 10-11 from consideration.

II. THE OBVIOUSNESS REJECTION TRAVERSE

The examiner rejected claims 3-9 under 35 USC 103(a) as being unpatentable over Borkholder (US 6,377,057). Claims 3-9 are non-obvious and patentable at least because the cited prior art does not disclose or suggest one or more features of independent Claims 3-4, 6 and 9.

Borkholder is referenced and distinguished from the claimed invention on page 2 of the present application, where it is noted that the method of Borkholder is relatively unsophisticated, providing only a single feature (power spectral density) to be interpreted. The present invention, in contrast to Borkholder, enables almost any feature that describes electrical activity of the cells to be included in the feature vector. This provides more accurate cell characterisation, and results in more reliable automated cell characterisation. This is because sophisticated analysis techniques such as clustering become possible using the vector data approach of the present invention.

The differences exhibited by the present invention over Borkholder would not have been obvious to the skilled person, as will be explained with reference to the specific claim features.

Referring to Claim 3, The Examiner has acknowledged that Borkholder does not teach the feature of an analyser to:

> "determine for each active channel a vector quantity having a number of dimensions equal to a number of features derived from the electrical output of said electrically active cellular network"

However, the examiner maintains that Borkholder suggests such a feature via its discussion regarding vector quantity. While the examiner has presented arguments concerning the "vector quantity", that is not enough to suggest the invention of claim 3 because in claim 3, a vector quantity is determined for <u>each</u> active channel. Borkholder does not teach determining values for each channel, nor does Borkholder teach determining a multi-dimensional vector quantity for each channel.

According to Claim 3, the present invention determines a multi-dimensional vector quantity corresponding to a plurality of features for each active channel. This differs from Borkholder not only because significantly more features are extracted, but also because multiple features for each channel are extracted. Thus the total amount of data is therefore considerably greater in the present invention, and of a scale not envisaged by Borkholder. In fact, the quantity of data gathered by the present invention would likely be considered as excessive in view of Borkholder. The present inventors however, as explained on page 2 of the application, have used their experience in the unrelated field of sonar signal processing – where very large quantities of data are generated - to arrive at the present invention, and to enable meaningful results to be produced. For at least this reason independent claim 3 is non-obvious and patentable in view of Borkholder.

In addition it would not have been obvious to modify Borkholder to arrive at the present invention. This is because the skilled person would not consider such an increment in terms of the quantity of information derived. Even if such an increment was suggested, the skilled person would likely consider this too complex, in the absence of the data processing techniques which the present inventors have adapted from a non-adjacent field.

In order to make out a prima facie case of obviousness, the examiner must establish that the claimed invention reasonably or logically follows from the limited teachings of the cited art. According to MPEP §§ 2142 and 2143, it is the Examiner's burden to establish a *prima facie* case of obviousness by clearly articulating reasons with rational factual underpinnings to support the conclusion of obviousness. A second reason why it would not be obvious to modify Borkholder to arrive at the present invention therefore presents itself. In particular, it would not have been apparent to one skilled in the art at the time of the invention how to modify the output format of Borkholder to incorporate the significant increase in data provided by the present invention, or even whether such modification is possible. In other words, the claimed inventions do not reasonably or logically flow from the Borkholder disclosure. Considering Figure 6 of Borkholder for example, the output of the analysis is presented as a single simple plot of power density ration against frequency. Before the skilled person can attempt the multi-variable, multi-channel approach of the present invention, not only is a step change in data processing techniques required, but also further inventive thought must be directed at whether such newly acquired data can be used to provide a meaningful output, or whether the demonstrated output provided by Borkholder becomes lost amongst less meaningful data. A novel and non-obvious solution is taught in the present invention - that of using multi-variable cluster analysis for example, as illustrated in Figure 8. This claimed solution does not flow from Borkholder and Claim 3 is patentable for this reason as well.

Independent Claims 4 and 6 have been amended and the above to include the same features that renders independent Claim 3 non-obvious and patentable. In addition, Claims 5 and 6-8 are patentable at least by virtue of their dependence upon on of independent Claims 3-4 or 6.

Claim 9 is non-obvious and patentable for the same reasons recited above with respect to Claim 3. Claim 9 is drawn to an electrode "array" associated with a "biocompatible substrate". Borkholder does not disclose or suggest such a combination. Instead all the Borkholder discloses in passing is "electrically active living cells cultured on extracellular electrode arrays. . . " (See Borkholder at col. 1, lines 14-16). Clearly, this excerpt of Borkholder is not a disclosure of a biocompatible substrate associated with an electrode array and claim 9 is non-obvious for at least this reason.

III.   NEW CLAIMS 14-19

New Independent claims 14-19 are added to the application above. The new dependent claims are directed to additional features made possible by the novel arrangement of the present invention. The newly claimed features are non-obvious and patentable over Borkholder.

Claims 14, 15 and 16 are directed toward features which exploit the use of simultaneous feature extraction from multiple channels. Claim 14 contains the feature that a subset of channels can advantageously be selected, while Claim 15 is directed to an embodiment in which the subset is selected based on the non-zero number of spikes or action potentials. Basis for these claims can be found at page 17, lines 4-14 of the published PCT specification for example. These claim features are not disclosed in Borkholder and are not suggested or obvious, because Borkholder is not concerned with feature extraction performed across multiple channels.

Claim 16 is directed to embodiments in which an average is taken across a feature set for a given feature, and Claim 17 to embodiments in which the standard deviation is calculated. Basis for these claims can be found at page 17, lines 16-24 for example. Again these two claim features are not disclosed or suggested in Borkholder. Only a single feature is referred to in Borkholder – power spectral density, and nowhere is averaging or other statistical measures of multiple power spectra taught or suggested in Borkholder.

Claim 18 is directed to embodiments in which both local and global features are derived, as disclosed on page 7, lines 20-31 of the published PCT specification for example. As already noted, Borkholder does not disclose the extraction or derivation of multiple features, neither does Borkholder disclose feature extraction across multiple channels. The proposal in Claim 17, of multiple different classes of features, and global features requiring feature extraction across multiple channels, is therefore a significant departure from the teaching of Borkholder, and one which is in no way suggested or could reasonably be contemplated by the skilled reader.

Finally Claim 19 refers to the particular feature of propagation speed of action potentials. It follows from all the reasons provided above that the subject matter of this claim is neither anticipated by, nor rendered obvious from the teaching of Borkholder.

CONCLUSION

Pending application claims 3-9 and 14-19 are believed to be non-obvious and patentable for at least the reasons recited above. Favorable reconsideration and allowance of all pending claims is, therefore, courteously solicited.

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By: _/A. Blair Hughes/_____
A. Blair Hughes
Reg. No. 32,901
312-913-2123
hughes@mbhb.com